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**FEDERAL COMMUNICATIONS COMMISSION**  
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Federal Communications Commission  
Office of the Secretary

ORIGINAL  
FILE

In the Matter of  
Advanced Television Systems  
and Their Impact upon the  
Existing Television Broadcast  
Service

MM Docket No. 87-268

**COMMENTS OF THE**  
**UNITED STATES ADVANCED TELEVISION SYSTEMS COMMITTEE**  
**(ATSC)**

The United States Advanced Television Systems Committee (hereinafter "ATSC") hereby comments upon the Notice of Proposed Rulemaking, released November 8, 1991 ("Notice").

The United States Advanced Television Systems Committee was established in late 1982 by the Joint Committee on Inter-Society Coordination (JCIC) to coordinate and develop voluntary national technical standards for advanced television systems. The JCIC members — the Electronic Industries Association, the Institute of Electrical and Electronics Engineers, the National Association of Broadcasters, the National Cable Television Association, and the Society of Motion Picture and Television Engineers — are Charter Members of the ATSC. More than fifty corporations, companies, television networks, associations and universities are members of the ATSC and cooperate in the work of the organization. As such, the ATSC is broadly representative of virtually all facets of the United States television, motion picture, and electronics industries on the specific topic of Advanced Television.

The technical work of the ATSC is divided between two Technology Groups:

**Technology Group on Distribution** This technology group develops and recommends voluntary national technical standards for the distribution of television programs to the public using advanced television technology. All forms of distribution are considered; e.g., terrestrial broadcasting, cable systems, direct satellite broadcasting and pre-recorded media.

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**Technology Group on Production** This technology group develops and recommends voluntary national technical standards for production of television programs using advanced television technology.

This Notice marks another of the seminal Commission proceedings which, during the past half century, have defined for the American public the most robust and informative television system in the world. From the selection of the NTSC<sup>1</sup> monochrome system as the standard for United States television to the choice of "compatible color," and more recently, regulatory action concerning cable television and access to satellite broadcasting, the Commission has encouraged the development of a delivery system of news, public affairs and entertainment which has changed the nation. The choice of an Advanced Television System at this time is no less important. The decisions made in this proceeding will specify the technical quality of television to be viewed by the American public well into the next century. The ATSC is honored to be a part of this decision-making process and is pleased to submit the following comments.

## **1. ELIGIBILITY**

It is essential that all broadcasters (both licensees and permittees) be enabled to participate in the introduction of terrestrial HDTV<sup>2</sup> broadcasting and the Commission is therefore correct to limit initial eligibility for HDTV channels to existing stations. Notice at ¶ 6. To attempt to go further would jeopardize the possibility that all stations would be provided with the necessary additional 6 MHz to provide this improved and expanded service. At the conclusion of the initial assignment of channels on a paired basis to existing broadcasters, all remaining spectrum may then be made available on an appropriate basis to applicants with active petitions for allotments pending and to new applicants under normal FCC processing procedures. The Commission is correct in its tentative view that restricting eligibility to existing broadcasters is legally permissible and

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<sup>1</sup> National Television System Committee

<sup>2</sup> Throughout this document the term HDTV is frequently used in lieu of ATV. It is apparent the Commission wishes the television industry to deliver full High Definition Television to the American public rather than a lesser version of Advanced Television. At the time of these comments, five of the six proposals under consideration are, in fact, full HDTV.

consistent with the Supreme Court's decision in Ashbacker Radio Corp. v. FCC<sup>3</sup> where, as here, the additional spectrum is being used specifically to improve and expand services rather than to create a new class of service altogether. Notice at ¶ 7.

## **2. APPLICATIONS AND CONSTRUCTION PERMITS**

The Commission has obvious and necessary reasons to limit the time period within which to reserve spectrum for the initiation of HDTV broadcasting in the United States. Notice at ¶¶ 11 & 14. It cannot permit the initial time frame to be open-ended. By the time a final decision is reached in this docket, a UHF-TV "freeze" will already have been in effect for six years. The question arises as to what additional time period can be tolerated without unduly burdening broadcasters who will have to secure funding for new HDTV programming and construction, then locate equipment (which has not yet been invented), and install, test, and inaugurate the new HDTV service.

On its face, the suggestion of the Commission that a five-year term for filing applications and constructing the stations seems completely reasonable. However, much remains to be learned during the coming two years, especially regarding the pace of equipment development and programming. The ATSC suggests that this decision be delayed until more is known. Perhaps other filings in response to the instant Notice will shed light on this issue and further inquiry on this matter can then be made. One thing is clear. If today was the beginning of the five-year period discussed in the Notice, it would be impossible — because of the various unknowns discussed above — for all stations to become operational with HDTV within that time frame. However, depending upon the system chosen for HDTV terrestrial broadcasting, circumstances may change radically during this decisional period and five years may appear more reasonable in 1993. This is one topic which cannot be decided early.

Finally, the Commission may have the ability to modulate the application and construction period with its normal attention to requests for extensions of time to construct facilities. Notice at ¶ 14. These extensions are normally granted for good cause on a case by case basis, and they could prove particularly useful in this situation where hundreds of stations will be attempting to simultaneously procure and install an extensive array of new video distribution equipment. If a relatively short construction

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<sup>3</sup> 326 U.S. 327 (1945).

period is finally decided to be essential in this matter, extensions should not be precluded. To do so may discourage stations from moving forward out of fear that partially completed construction may have to be abandoned for reasons well beyond the control of the licensee.

### **3. INITIAL ASSIGNMENT OF ATV CHANNELS**

The ATSC enthusiastically endorses a Commission plan which would allot HDTV channels to each local community now served by a local television outlet and to amend the Table of Allotments which matches specific ATV channels to those allotments currently listed in the Table. Notice at ¶ 16. In order to create the most efficient allotment plan, this procedure cannot be "random." It will need to take into consideration various computer studies as to which specific channel should be paired with each specific NTSC channel. Much will be learned during the next two years as to which plan will, in fact, maximize this allotment process. When that information is known, the Commission will then be in a position to issue a pairing plan which will provide maximum coverage area for each new HDTV facility, and thus will maximize the number of viewers to be served with this new technology. To the extent that the Commission can provide a complete pairing plan which would include every station in the United States, the possibility of protracted litigation will be reduced markedly. With less arbitration over individual allotments comes more rapid service to the public.

In the unlikely event that an insufficient number of channels is available to provide a second (HDTV) channel to every licensee, permittee, and vacant allotment, the Commission should provide channels in such a way that current broadcasters are the first to receive new allotments. Thus, it is suggested that the Commission provide channels first to existing licensees, then to those holding construction permits which are constructed but not yet licensed, then to unconstructed permittees, and finally to unapplied-for allotments. In this way, maximum service from the additional allotments may be expected to be achieved in the shortest possible time. In any event, lotteries should be avoided if at all possible because they are likely to result in some grants being made to those who are least likely to construct, thus slowing service to the public.

If a complete pairing plan is not achievable, post-assignment negotiations among licensees in a given community could likewise expedite service to the public. Notice at ¶ 21. When a licensee is able to quickly obtain a preferred channel for HDTV

service, that licensee is likely to construct rapidly and to provide service to the public in a more timely manner. The ATSC thus supports such negotiations as an extension of the Commission's normal allotment and assignment processes in this specific case.

Assuming all existing licensees can be accommodated with HDTV channels, it would appear that nothing is to be gained by establishing a financial qualification showing as a condition for assigning the channel. This is especially true if the Commission specifies a fixed construction period. One or the other procedure should sufficiently guard against warehousing of spectrum. Initiating both policies would not appear to be necessary and could be counterproductive in those cases where licensees wish to go forward incrementally as funds become available.

#### **4. SPECTRUM ISSUES**

The Commission is correct to try to protect noncommercial allotments even in those cases where the allotments are not applied for. Notice at ¶¶ 27 & 28. Noncommercial stations provide a unique safety net in the television system of the United States, providing programming that may not be financially viable for commercial stations.

The same considerations do not exist for LPTV or translator stations. Licensees and permittees of these facilities accepted grants on the clear understanding that they held a "secondary" status in comparison to full power stations and they knew when they built their facilities that the license could be recalled at any time. It is to be hoped that minimum disruption will occur to these facilities and there is considerable expectation that they will not be affected in most rural areas where they provide a more essential service to rather sparse population distributions over large geographical areas. The Commission is correct to retain the secondary status of LPTV and translator stations while attempting to accommodate them with alternative assignments wherever possible. Notice at ¶ 32. In the final analysis, however, the secondary LPTV or translator station must yield to the full power station as the improved and expanded HDTV service begins to be initiated.

It would be advantageous to stations beginning HDTV service to be able to call upon additional Broadcast Auxiliary spectrum, but the source of that possible new spectrum is not at hand. However, work continues to be done in the Advisory

Committee on Advanced Television Service (hereinafter "Advisory Committee") concerning this specific matter and more may be learned of both the requirements for additional spectrum and the possible source of that spectrum during the coming two years. The Commission may wish to withhold judgment on this issue until results of the current studies are available.

## **5. CONVERSION TO ATV**

Once the conversion to HDTV is underway in the United States, it will be correct to assume that at some point in the future NTSC television will cease to exist. Notice at ¶ 34. It is also understood that one of the channels occupied by an NTSC/HDTV station will then be returned to the Commission. What is virtually impossible to predict, however, is when that date will arrive. Many new marketplace forces will be felt as the conversion timetable begins to unfold. For example, as consumer equipment costs decline, more receivers will be purchased and more broadcasters, cable operators, etc., will want to provide HDTV programming. And, we know from past experience that the introduction of programming will drive the consumer electronics market as well. At some point (at about the 1% penetration rate for consumer equipment) the transition to HDTV will pick up steam and move much more rapidly. Color television took about 7 years to reach this point, but black and white television took less than 2 years from FCC spectrum decisions to reach 1% penetration. In the case of audio compact discs, within a period of only five years analog records virtually disappeared from store shelves. Market studies failed to predict any of these events. We will not know a great deal about the rate of conversion to HDTV until stations are on the air and receiving equipment is available off the shelf.

There is a possibility that the consumer electronics industry may be able to achieve a very inexpensive converter which might be used at the "front-end" of an NTSC television receiver (perhaps attached to the antenna input or included in the cable set-top converter). Such a converter would permit the display of HDTV signals on inexpensive, small screen NTSC receivers. In fact, it is not unreasonable to assume that such converters may be built-in to future low-end or portable television receivers of the type used in the kitchen or children's rooms. If this should be achieved, the number of HDTV receivers purchased may not be the only market indicator to be considered by the Commission when it decides to shut-down NTSC transmitters.

All this suggests that the Commission should be extremely careful in establishing a date after which all television in the United States must utilize HDTV technology. It is an issue which should be revisited each year or two after the decisions of 1993 are implemented in order to assess the market situation then prevailing. A decision for complete conversion to ATV can then be made, based not upon today's estimates but upon past accomplishments. The ATSC is not prepared at this time to conjecture as to what specific percentage of penetration should be used by the Commission to dictate a "shut-down" of all remaining NTSC facilities.

Finally, concerning the issue of conversion, comment was sought on the possibility of allowing a licensee to remain on its originally assigned frequency. Notice at ¶ 42. The Commission should also consider the possibility that television licensees who are currently operating in the VHF television band (channels 2 - 13) may indeed seek not to maintain any operations in that band in light of facts which may become evident when the date of final conversion is reached.

While the technical parameters of new digital transmitting equipment are unknown at this time, the new equipment may operate at lower powers with equivalent coverage in the UHF spectrum. Some even predict that digital transmission schemes may virtually eliminate the advantages of VHF over UHF. The Commission has long wished it could revisit the original decision to allocate VHF spectrum for television and has long lamented the disparities felt by licensees at UHF. At some time in the future — perhaps in the next century — this proceeding, or one which might follow, could provide the vehicle for "refarming" the VHF television spectrum for other uses. It would be wrong to assume at this time that licensees will wish to move their HDTV programming to VHF and no decisions should be made at this time which would promote such channel swapping for the next generation of television technology. Such UHF-for-VHF swapping could result in the eventual desire to "repack" virtually the entire VHF television band at great expense to many broadcasters. This is another area where final decisions may not be possible at this time given the lack of experience with the new technology. Clearly, after experience has been gained, a further proceeding will be required to resolve these matters. Technical and market information is simply not now available.

## **6. SIMULCASTING**

In order for HDTV to become a reality in the United States through its terrestrial television stations, simulcasting will have to be used. Notice at ¶ 45. Initially, virtually every station will simulcast to the maximum degree possible in order to not lose market share as consumers transition from NTSC to HDTV. As time progresses, and more and more consumers purchase new equipment, the market forces which had mandated full simulcast will abate. In fact, at this point it may be desirable to introduce some alternative programming to provide consumers with a greater perceived benefit from the purchase of their new HDTV equipment. It is at this stage of the conversion process where the Commission will need to protect the television viewer who has not yet purchased HDTV equipment for financial or other reasons.

Simulcasting at the later stages of HDTV development could be defined by specific percentages of programming or in other ways. Certainly, the Commission may not wish to mandate that every commercial message or promotional advertisement would have to be broadcast at precisely the same time on both the NTSC and HDTV channels. One alternative not mentioned in the Notice would be to require such programming as local news or emergency broadcasts be delivered on both channels in such a way that viewers of either channel might be assured they would not miss such important events. Throughout the transition period, the Commission should provide flexibility to broadcasters regarding simulcasting, particularly given the Commission's frequently stated First Amendment concerns. Requirements for simulcasting touch closely to basic programming decisions of television licensees.

## **7. PATENT LICENSING**

For HDTV broadcasting to succeed in the United States, the technology must be available to current and aspiring consumer electronics manufacturers. Further, it is correct that inventors of the technology be remunerated for use of their intellectual property. Organizations in the United States<sup>4</sup> write standards which make use of proprietary technology by requiring that the inventors agree to license the technology to

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<sup>4</sup> e.g., Advanced Television Systems Committee, American National Standards Institute, and Society of Motion Picture & Television Engineers.



applicants "under reasonable terms and conditions that are demonstrably free of any unfair discrimination." Because the Commission is planning to establish technical standards in this area, it is suggested that the selected technology be made available to others under these same conditions.

## **8. COMPATIBILITY WITH OTHER MEDIA**

The ATSC has been heavily involved in the issue of compatibility with other media for the past five years. Recently, both the ATSC and the Society of Motion Picture and Television Engineers (SMPTE) have co-sponsored three digital workshops with the Institute of Electrical and Electronics Engineers. These sessions brought together professionals in the computer and telecommunications fields and television experts in order to find common ground and cooperative ventures which could lead to the use of high resolution systems and HDTV for all industries. As a result of these meetings, SMPTE established two groups which are dealing with such issues as "headers/descriptors" for digital video and a hierarchy of digital HDTV image quality levels. Subsequent to these events, a working party of the Advisory Committee was expanded to further aid the Commission in these areas as decision dates draw near. Results of the work of this group will be provided to the Commission through the normal Advisory Committee reports by Chairman Richard E. Wiley. The ATSC encourages the Commission to consider the needs and desires of these alternative media keeping in mind that it is essential that decisions of the Commission be made in a timely fashion and, whatever decisions are reached, the resulting signal must fit into a single 6 MHz channel. Clearly there are technical areas (e.g., headers) where the Commission can provide considerable attention to the desires of other industries without jeopardizing the primary consumer interest in the new technology — efficient and economical delivery of television.

In a separate area more directly involved with television delivery to the home, the ATSC Technology Group on Distribution has released a status report on interoperability and consumer product interface (ANNEX 1). This report deals with a wide range of issues of alternative media including cable television, audio, set-top converters, direct broadcast satellites, pre-recorded media, fiber optic delivery of ATV and microwave media. The ATSC continues its studies in these areas and will distribute pertinent findings and recommendations to the Advisory Committee and the Commission as well as to proponents of terrestrial ATV systems and other interested parties.

## **CONCLUSION**

The ATSC is pleased to provide these comments in this very important rule making procedure. We applaud the Commission for the clarity and timeliness of the Notice. We agree with most of the tentative decisions reached in the Notice but we have outlined herein those areas which we believe are not yet ripe for final decisions. Others do need to be "nailed down" early so that all parties can continue to proceed toward final decisions in 1993 certain of future Commission actions and with sufficient confidence to invest in this new technology.

The Commission has embarked on a journey toward a new technology which will impact hundreds of millions of television viewers in a very direct way. The television, motion picture, and electronics industries of the United States do not minimize the importance of decisions which will be made in this matter.

Respectfully submitted,

**United States Advanced  
Television Systems Committee**  
1776 K Street, NW, Suite 300  
Washington, DC 20006

A handwritten signature in black ink, reading "James C. McKinney". The signature is written in a cursive style with a horizontal line underneath the name.

James C. McKinney  
Chairman

December 19, 1991

## ANNEX 1

Doc. T3/S2 - 0047  
20 August 1990

Rev. 1 3 September 1990  
Rev. 2 29 October 1990  
Rev. 3 13 November 1990  
Rev. 4 16 November 1990  
Rev. 5 31 December 1990

# **STATUS REPORT OF ATSC SPECIALIST GROUP ON INTEROPERABILITY AND CONSUMER PRODUCT INTERFACE (T3/S2)**

This Specialist Group was created in mid-1989 by the Technology Group on Distribution (T3) to study issues relating to interoperability among the various media that may be employed to deliver Advanced Television (ATV) service to U.S. consumers and to study the resulting impact on the interface between consumer products and the various media. Besides terrestrial broadcast, the other media, often referred to as alternate media, to be considered include Cable Television (Cable), Direct Broadcast Satellite (DBS), "wired" alternatives to Cable, e.g., switched broadband fiber optic links, and pre-recorded media, e.g., video tape and video disc.

## CHARTER

At the September 15, 1989 meeting of T3/S2, we adopted a Charter and Statement of Goals that was subsequently approved by T3 on September 18, 1989. A copy is attached as Appendix I.

## MEMBERSHIP

The membership of T3/S2 totals approximately 25 people representing a broad cross-section of the broadcast and alternate media community as well as consumer electronics manufacturers. Bernard J. Lechner (Consultant, Cable Television Laboratories) serves as Chairman. Tom Elliot (Cable Television Laboratories/TCI) and William Miller (Philips Consumer Electronics) serve as Vice Chairmen and Joe Waltrich (General Instrument) served as Secretary through our July 18, 1990 meeting. Our current membership roster is attached as Appendix II.

## CHRONOLOGY OF MEETINGS

T3/S2 has held eleven meetings, all but one, in Washington, D.C. Typically we have 12 members attending each meeting.

August 3, 1989  
September 15, 1989  
November 1, 1989  
January 18, 1990  
March 7, 1990  
April 19, 1990

Joint meeting with EIA-Multiport Receiver Subcommittee

April 20, 1990  
May 23, 1990  
July 18, 1990  
August 20, 1990  
October 9, 1990

At NCTA Convention in Atlanta, Georgia

### BACKGROUND

As the United States moves toward the adoption of standards for a terrestrial broadcast ATV service, it is important to recognize that ATV services also will be provided by the alternate media. Since these media have differing needs as well as differing technical and regulatory constraints, it is important to insure coordination and cooperation among all media in the development of standards so that program material delivered by any one medium also can be easily delivered by all other media and so that consumer receivers can be easily interfaced to all possible media. If this is not done, expensive conversion equipment might be required to exchange programming between media and, worse yet, consumer television receivers might require complex, and potentially user-unfriendly, interface boxes to receive programs from the alternate media.

This need has been recognized by the FCC Advisory Committee on Advanced Television Service (ACATS) and has been addressed in part by PSWP4 and by the Systems Subcommittee. Specifically SSWP4 recognized the importance of Cable in delivering terrestrial broadcast signals to consumers and has explicitly stated that any standard(s) adopted for terrestrial broadcast must be capable of being transmitted over Cable systems. The HDTV Subcommittee of the NCTA Engineering Committee, PSWP4 and Cable Television Laboratories (Cable Labs) have developed a test plan to evaluate the performance of proposed ATV systems when transmitted through Cable systems and over fiber optic links. Cable Labs plans to conduct tests of the proposed ATV systems at the ATTC and has contracted to use some ATTC facilities and equipment for these tests. Field tests are being planned by SSWP2 and will be conducted following completion of the tests at the ATTC. It is not anticipated that all systems will be field-tested.

PSWP4 also developed a test plan for satellite transmission, but at this time there is no concrete plan to implement satellite transmission tests. It must be noted, however, that the Satellite Broadcasting and Communications Association (SBCA) has expressed interest and Intelsat has volunteered to lend equipment. Also some private tests of ATV transmission through satellites and satellite simulators have been conducted.

In late 1988, PSWP4 as part of its work developed a strawman proposal for an ATV Multiport receiver interface that would make it possible for ATV receivers to interface to alternate media sources. Subsequently the EIA ATV Committee created an ATV Multiport Receiver

Subcommittee. This Subcommittee, which is now a part of the EIA R-4 Engineering Committee, has developed a detailed generic model of an ATV receiver multiport interface.

It is in the context of these various related activities that T3/S2 undertook its work in August, 1989. To insure that there would be neither competition nor unnecessary duplication of effort, we established and have maintained liaison with EIA, PSWP4, SSWP4, NCTA and the SBCA.

### ACTIVITIES OF T3/S2

With respect to the receiver interface issue, T3/S2 believed from the outset that the EIA Subcommittee had this well in hand. We have reviewed drafts of their reports at various stages and provided our comments. We also held a joint meeting with the EIA Subcommittee in April, 1990. It is still our belief that the EIA Subcommittee is doing a fine job and that, other than maintaining liaison, there is no need for specific work in this area by T3/S2 at this time. An important area for future joint work is the interfacing of control signals between ATV receivers and alternate media services, especially controlled access programming.

Early in our work, T3/S2 realized that the alternate media were free to choose ATV standards totally unrelated to those developed for terrestrial broadcast. We concluded that such a scenario was both unwise and unlikely, and in any event, unless and until some medium chose such a standard, there was little if anything we could do to deal with its interoperability with other media. Recognizing that the various media will employ different modulation methods and may format and condition the signals for transmission differently, we concluded that the requirements for interoperability and consumer product interface would be most easily met if all media were to adopt substantially the same baseband video signal format. We made this statement intentionally vague to allow for the possibility that small variations among media will allow exploitation of extra capability by a given medium or fitting within a constraint by another medium without unduly compromising interoperability or complicating the interface. As an example, VHS tape has less luminance bandwidth than NTSC and S-VHS has more luminance bandwidth.

### CABLE TELEVISION

An early activity of T3/S2 was to review the work previously done by PSWP4. PSWP4 provided us with a copy of its May 9, 1988 final report that contains a wealth of information and has served as background material for our work and provided us with a point of departure.

We decided initially to concentrate on Cable and to characterize the needs of Cable in an ATV environment. We agreed that most of the issues of concern to the Cable industry would be covered by the test program to be conducted by Cable Labs at the ATTC. The major issue that is not currently covered by the Cable test plan is scrambling and the need for data transmission to control conditional access to scrambled programming. Since the data transmission for controlling access falls within the charter of the Specialist Group on Digital Services (T3/S3), starting with our January 18, 1990 meeting, T3/S2 has met jointly with T3/S3. At that meeting we agreed to develop an attributes list for scrambling and conditional access to be applied to the proposed ATV systems.

At our March 7, 1990 meeting, we reviewed the criteria for scrambling and conditional access used by the DBSA four years ago and a list of attributes generated by the Chairman of T3/S3. We reached a consensus on what we believed to be a reasonable set of minimum requirements for a conditional access systems and, on April 12, 1990, we wrote a letter to the ATV proponents asking them to provide information about how they would propose to meet the requirements for scrambling. A copy of the letter is attached as Appendix III.

We are very pleased to report that we received written responses to our letter from Sarnoff, Faroudja, General Instrument <sup>1</sup>, NHK, North American Philips, and Zenith. This represents 6 of the 7 systems then scheduled for test by the ATTC and Cable Labs <sup>2</sup>. Only MIT failed to respond. Copies of the responses received are attached as Appendix IV.

At our May 23, 1990 and July 18, 1990 meetings we reviewed the responses in detail and formed some conclusions and recommendations. The responses are most readily dealt with in three categories:

#### NTSC-COMPATIBLE ATV SYSTEMS

The Sarnoff <sup>3</sup> and Faroudja systems fall in this category. Both responses indicated that since these systems are NTSC-Compatible, sync-suppression scrambling as currently used for NTSC can be applied. Sarnoff points out that this is appropriate for the near term and, that should other more sophisticated and more secure systems be developed for NTSC, Sarnoff is confident that they also can be applied to ACTV. Since present sync-suppression systems may encroach slightly on active video and since ACTV uses the extremes of the active video (first and last 1.5  $\mu$ seconds of active line time) for transmitting low-frequency side-panel information, T3/S2 is concerned that ACTV will not work satisfactorily with present sync-suppression systems. In their response Sarnoff acknowledges awareness of this issue and states that, "(they) have begun negotiations (and expect further involvement) with the cable equipment community to determine the fine-tuning of sync-suppression specifications and ACTV specifications that will be necessary for ACTV to be single-channel compatible in today's scrambled cable environment."

If the fine-tuning of the sync-suppression specifications and ACTV specifications can be accomplished so that adjustments and/or modifications to the head-end sync-suppression

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<sup>1</sup> Actually the General Instrument system was not announced until late May and their submission to T3/S2 was in response to our May 28, 1990 letter to DBS proponents (see discussion of DBS on page 7 below). However, they provided us with the same material that was submitted to SSWP1 and we treated their submission as that of a terrestrial proponent.

<sup>2</sup> Faroudja has since withdrawn from the FCC test program.

<sup>3</sup> The Sarnoff response refers to the ACTV system proposed by the Advanced Television Research Consortium (ATRC) consisting of Sarnoff, NBC, Thomson Consumer Electronics and North American Philips.

scrambling equipment and modified or new designs for ACTV descramblers (set-top or multiport) are all that are required, the concerns of T3/S2 would be satisfied. The important issue is that present Cable subscribers with present descramblers and NTSC receivers must receive a satisfactory descrambled NTSC picture without requiring any change, adjustment or modification of the presently installed base of sync-suppression descramblers, notwithstanding any changes to the present head-end scramblers to make them compatible with ACTV.

#### SIMULCAST SYSTEMS EMPLOYING ANALOG TRANSMISSION OF THE VIDEO SIGNAL

The NHK and North American Philips <sup>4</sup> systems fall in this category. Although neither response gives a specific implementation, both propose to employ a more sophisticated approach than sync suppression. NHK proposes to use line rotation (line cut) and/or line permutation, and North American Philips proposes to use line rotation (line cut) or line translation. North American Philips promises more details in a few months.

#### SIMULCAST SYSTEMS EMPLOYING DIGITAL OR HYBRID DIGITAL/ANALOG TRANSMISSION OF THE VIDEO SIGNAL

The General Instrument and Zenith systems fall in this category. The General Instrument system is all-digital; the Zenith system is a hybrid <sup>5</sup> digital/analog system. Both responses indicate that the signal can be scrambled by encrypting the digital signal bit-by-bit or word-by-word. Zenith also points out that the analog sub-band components in this signal also can be scrambled, presumably by scrambling the multiplex.

Although we did not receive a response from MIT, the proposed MIT system also would fall in this category and could be scrambled in similar fashion to the General Instrument and Zenith systems.

#### AUDIO SCRAMBLING

Most of the responses we received did not specifically address the issue of scrambling the audio. However since all proponents propose to provide a digital audio channel, this channel can obviously be scrambled by bit-by-bit encryption of the digital data stream as suggested in the NHK response and is implicit in the General Instrument and Zenith responses. For the NTSC-Compatible systems (Sarnoff and Faroudja), the analog BTSC audio signal must be maintained and presumably would be transmitted in the clear.

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<sup>4</sup> The North American Philips response refers to the simulcast system proposed by ATRC. Subsequent to the completion of the T3/S2 study, ATRC announced that its simulcast system will be all digital.

<sup>5</sup> Subsequent to the completion of the T3/S2 study, Zenith announced that its simulcast system will be all digital.

## SET-TOP CONVERTER ISSUES

During our discussions, the issue of the transparency of present set-top converters to the proposed ATV signal formats came up. We agreed that none of the existing set-top converters, baseband or heterodyne-RF, is likely to be transparent to any of the proposed ATV signal formats. The baseband converters obviously will not demodulate the digital audio subcarriers proposed by Sarnoff and Faroudja and equally obviously will not properly demodulate any of the proposed simulcast signal formats. Heterodyne-RF converters probably will pass the digital audio subcarriers proposed by Sarnoff and Faroudja but may attenuate them relative to visual carrier because of converter filter characteristics. The large amount of incidental phase modulation introduced by present heterodyne-RF converters will likely make it impossible to recover the high-frequency luminance information in the Sarnoff system, since it is transmitted by quadrature modulating the visual carrier. Similarly the simulcast systems proposed by General Instrument, Zenith and MIT all employ quadrature modulation and will not be recoverable after passing through present heterodyne-RF converters. The North American Philips and NHK simulcast proposals distribute the energy over the 6-MHz channel quite differently from NTSC and present converter filter characteristics may corrupt the recovered signals. Also in the case of the North American Philips signal format, which uses multiple subcarriers, incidental phase modulation is likely to be a problem.

However, the lack of transparency of present set-top converters is not really a problem for implementing ATV on Cable. When ATV is implemented, a consumer wishing to receive it must buy a new ATV receiver that is likely to tune all Cable channels and will not require a set-top converter. The new receiver may, however, require a descrambler for premium services that will be provided by the Cable system operator. This could be a new set-top converter with both NTSC and ATV descrambling capability, but preferably it would be a baseband descrambler for both NTSC and ATV signals that would connect to the ATV multiport, which we expect will be provided on all ATV receivers.

In evaluating the proposed ATV signal formats there is only one converter issue that needs to be considered. For the NTSC-Compatible ATV systems (Sarnoff and Faroudja) it must be shown that these signals can pass through existing set-top converters and produce satisfactory NTSC pictures on existing receivers. T3/S2 presumes that the Cable test program to be carried out by Cable Labs at the ATTC will include such tests.

The activities of T3/S2 with respect to Cable delivery of ATV signals have concentrated on the scrambling and conditional access issues as discussed above. Equally important is the question of the data channel that delivers the digital control signals to implement the various features (tiering, impulse pay-per-view, subscriber authorization, billing, etc.). These issues fall within the purview of T3/S3 and have been discussed in our joint meetings. With our cooperation T3/S3 has developed a specification of desirable attributes, desirable features and other considerations for controlled access encryption systems. T3/S3 has also catalogued current addressable cable scrambling systems. We believe that this is valuable information for the proponents of ATV transmission systems and we encourage T3/S3 to communicate this information to the proponents and solicit their reactions and comments. We also believe that inputs from Cable system operators and the providers of premium Cable programming should be sought with the ultimate objective of finding a set of minimum requirements that can serve as the basis for a voluntary industry standard



against which hardware and software can be designed and built to satisfy the needs of all industry segments and especially the consumers who subscribe to Cable services.

### DIRECT BROADCAST SATELLITES

Beginning at our March 7, 1990 meeting we began to study satellite (DBS) delivery of ATV programming to consumers. We understood that the SBCA was planning to distribute a questionnaire to present and prospective satellite programmers concerning ATV-related issues. Since this process is moving slowly, T3/S2 decided at its May 23, 1990 meeting to send a slightly modified version of our April 12, 1990 letter to terrestrial broadcast ATV proponents to those organizations known to be proponents of systems for DBS transmission of ATV signals. The letter, which is attached as Appendix V, was sent on May 28, 1990. To date we have received only one response, from General Instrument <sup>6</sup>. We will follow up on this issue and will coordinate our follow-up with the SBCA.

T3/S2 believes that satellite (DBS) transmission of ATV to consumers will be an important delivery medium. We are concerned that it is receiving less attention than it deserves. We are also concerned that the proponents of DBS transmission are not actively participating in the process of developing ATV standards (witness the lack of response to our May 28, 1990 letter). Consistent with our early conclusion that all media should employ substantially the same baseband video signal format adopted for terrestrial broadcast transmission of ATV signals, we believe that it is important to convey this message to those contemplating DBS transmission since it can lead to the development of voluntary DBS standards that will permit easy interoperability between DBS and other media as well as facilitate a user-friendly consumer product interface.

### PRE-RECORDED MEDIA

With respect to pre-recorded media, we discussed this issue at several of our meetings and in particular discussed it during our April 19, 1990 joint meeting with the EIA Multiport Receiver Subcommittee. Our conclusion is that voluntary standards for pre-recorded media will evolve naturally once terrestrial broadcast and alternate media transmission standards are established, much as the present standards for pre-recorded media for NTSC came into being. The EIA has given this matter some consideration, but they and we believe that it is premature to be specific about signal formats for pre-recorded media. We will continue to follow this issue and will revisit the specifics as appropriate when we move closer to the adoption of a terrestrial standard.

### FIBER OPTIC DELIVERY OF ATV

There has been much said about the delivery of ATV signals to consumers by Telephone Companies using fiber optic links. Digital delivery as a part of the Broadband Integrated Services Digital Network (BISDN) is frequently mentioned. Since the question of ATV signal delivery by

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<sup>6</sup> As discussed above, the response from General Instrument was treated with the other terrestrial proponents. We also note that Zenith, in responding to our April 12, 1990 letter, provided information relating to satellite transmission of their proposed simulcast system.

Telephone Companies compared with delivery by traditional Cable system operators is a political and/or regulatory issue and not a technical issue, T3/S2 has chosen to concentrate only on the technology employed to deliver the ATV signals to the consumer and not on the business entities providing the delivery. It is our understanding that the tests to be conducted at the ATTC by Cable Labs will cover both co-axial cable and fiber optic link technology for the delivery of the various proposed ATV signal formats to consumers. Therefore the necessary technical information for the comparative evaluation of the proposed ATV systems when transmitted over fiber optic links will be developed and can be applied to the standards decision process.

### MICROWAVE MEDIA

T3/S2 has not studied the issues relating to delivery of ATV signals by MDS, MMDS or ITFS systems.

### FINDINGS

Following is a brief summary of the key points developed by T3/S2 in its work to date:

#### VIDEO SCRAMBLING

It seems likely that NTSC-Compatible ATV systems will employ sync-suppression video scrambling, at least initially. Simulcast ATV systems will employ more sophisticated scrambling techniques. Analog transmission systems will use line-rotation, line translation or line permutation or some combination thereof; systems sending all or part of the signal digitally will employ encryption of the bit stream.

#### SET-TOP CONVERTERS

Present set-top converters are not transparent to ATV signals. This is not a problem for ATV reception since a new ATV receiver will be required and, as receivers are bought by consumers, the present converters will be replaced one-by-one with either a new converter or preferably a multiport descrambler. It must be demonstrated that NTSC-Compatible ATV systems can deliver satisfactory NTSC pictures to existing NTSC receivers through existing set-top converters.

#### RECEIVER INTERFACE

The EIA ATV Multiport Receiver Subcommittee has this well in hand and has developed a detailed generic model for an interface. The major open issue is the interfacing of control signals for alternate media services.

#### DBS

There is a need for a test program to evaluate satellite transmission of ATV signals. Besides the transmission issues most of the other factors, e.g., scrambling, receiver interface, etc., are similar to those for Cable.

### PRE-RECORDED MEDIA

Since voluntary industry standards are likely to evolve naturally once transmission standards are decided, it is premature to be specific about signal formats.

### MDS, MMDS AND ITFS

We have not specifically studied these transmission media.

### RECOMMENDED ACTIONS

T3 should encourage all alternate media to adopt ATV signal formats that use substantially the same transmission baseband video signal format that is finally adopted by the FCC for terrestrial broadcast of ATV.

T3 should encourage greater participation in its work and the work of its specialist groups T3/S2 and T3/S3 by the DBS community. T3 also should encourage the establishment and implementation of a satellite test program for ATV.

T3 should encourage participation by ATV proponents and other interested parties in the work of its specialist groups T3/S2 and T3/S3 concerning the possible development of standards for scrambling and conditional access.

T3 should encourage continued work by the EIA Multiport Receiver Committee to develop an interface that will serve the needs of all media expected to deliver television programming to U.S. consumers.

T3 should provide regular inputs concerning its work to the ACATS SSWP4 for their consideration in arriving at a recommendation concerning ATV standards for terrestrial broadcast.

### PLANS FOR FUTURE WORK BY T3/S2

T3/S2 will continue to study the issues involved in developing standards for scrambling and conditional access taking into account the level of standardization that is appropriate and achievable.

T3/S2 also will continue its liaison with the EIA Subcommittee and with T3/S3.

T3/S2 will attempt to strengthen its liaison with the SBCA and concentrate its near-term efforts on satellite delivery of ATV signals. We will attempt to open a dialog with the proponents of DBS transmission systems.

T3/S2 also will study MDS, MMDS and ITFS delivery of ATV signals attempting to identify issues relating to interoperability and consumer product interface.